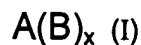


- 24 -

WHAT IS CLAIMED IS:

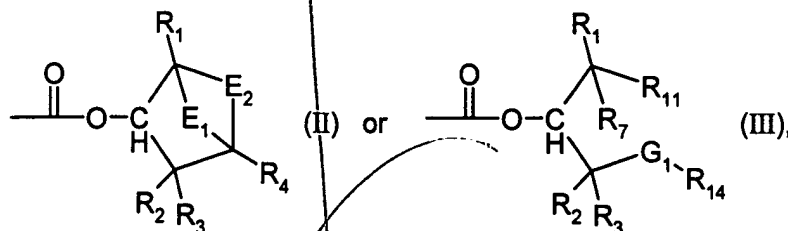
1. A compound of the formula



where x is an integer from 1 to 8,

A is the radical of a chromophore of the quinacridone, anthraquinone, perylene, indigo, quinophthalone, indanthrone, isoindolinone, isoindoline, dioxazine, azo, phthalocyanine or diketopyrrolopyrrole series, this radical being linked with x B groups via one or more heteroatoms, these heteroatoms being selected from the group consisting of N, O and S and forming part of the radical A, and

B is hydrogen or a group of the formula



although at least one B group is not hydrogen and when x is from 2 to 8 the B groups may be identical or different,

$E_1$  is oxygen or is selected from the group consisting of methylene, methyleneoxy and ethylene, each member of the group being unsubstituted or substituted by one  $R_5$  or by 2 radicals,  $R_5$  and  $R_6$ , or is two separate radicals,  $R_7$  and  $R_8$ ,  $R_7$  being attached to the same atom as  $R_1$  and  $R_8$  to the same atom as  $R_4$ ,

$E_2$  is selected from the group consisting of methylene, ethylene, propylene and butylene, each member of the group being unsubstituted or substituted by one  $R_9$  or by 2 radicals,  $R_9$  and  $R_{10}$ , or is two separate radicals,  $R_{11}$  and  $R_{12}$ ,  $R_{11}$  being attached to the same atom as  $R_1$  and  $R_{12}$  to the same atom as  $R_4$ ,

$G_1$  is O or N( $R_{13}$ ),

$R_1$  is hydrogen, methyl, ethyl, methoxy or ethoxy,

R<sub>2</sub> and R<sub>3</sub> are independently hydrogen, C<sub>1</sub>-C<sub>8</sub>alkyl, C<sub>1</sub>-C<sub>8</sub>alkoxy, C<sub>1</sub>-C<sub>8</sub>alkoxy-C<sub>2</sub>-C<sub>8</sub>alkylene or C<sub>1</sub>-C<sub>8</sub>alkoxy-C<sub>2</sub>-C<sub>8</sub>alkyleneoxy,

R<sub>4</sub> is hydrogen, C<sub>1</sub>-C<sub>8</sub>alkyl, C<sub>1</sub>-C<sub>8</sub>alkoxy, C<sub>1</sub>-C<sub>8</sub>alkoxy-C<sub>2</sub>-C<sub>8</sub>alkylene, C<sub>1</sub>-C<sub>8</sub>alkoxy-C<sub>2</sub>-C<sub>8</sub>alkyleneoxy, C<sub>5</sub>-C<sub>6</sub>cycloalkyl, C<sub>5</sub>-C<sub>6</sub>cycloalkoxy, phenyl, phenoxy or a 5- or 6-membered, saturated or singly to triply unsaturated heterocyclic radical,

R<sub>5</sub>, R<sub>6</sub>, R<sub>9</sub>, R<sub>10</sub> and R<sub>12</sub> are independently C<sub>1</sub>-C<sub>8</sub>alkyl or C<sub>1</sub>-C<sub>8</sub>alkoxy, or R<sub>8</sub> and R<sub>9</sub> together are a direct bond,

R<sub>7</sub> and R<sub>8</sub> are independently hydrogen, C<sub>1</sub>-C<sub>8</sub>alkyl, C<sub>1</sub>-C<sub>8</sub>alkoxy, C<sub>1</sub>-C<sub>8</sub>alkoxy-C<sub>2</sub>-C<sub>8</sub>alkylene or C<sub>1</sub>-C<sub>8</sub>alkoxy-C<sub>2</sub>-C<sub>8</sub>alkyleneoxy,

R<sub>11</sub> is hydrogen, C<sub>1</sub>-C<sub>8</sub>alkyl or C<sub>1</sub>-C<sub>8</sub>alkoxy,

R<sub>13</sub> is methyl or ethyl, and

R<sub>14</sub> is C<sub>1</sub>-C<sub>8</sub>alkyl, C<sub>5</sub>-C<sub>6</sub>cycloalkyl, phenyl or a 5- or 6-membered, saturated or singly to triply unsaturated heterocyclic radical,

it being possible for two methoxies attached to the same carbon atom to combine and form 1,2-ethylenedioxy, or for methoxy to combine with ethoxy attached to the same carbon atom to form 1,2- or 1,3-propylenedioxy, or for methoxy or ethoxy to combine with ethoxy attached to α- or β-enchain carbon to form dimethylmethylene,

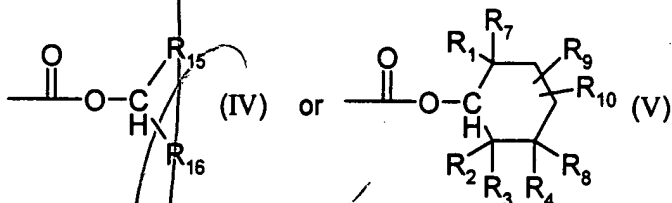
and where additionally

- a) R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>7</sub> or R<sub>11</sub> is hydrogen, and
- b) when E<sub>1</sub> is two separate radicals R<sub>7</sub> and R<sub>8</sub> and E<sub>2</sub> is methylene or ethylene at least one of the following further conditions applies:
  - R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>7</sub>, R<sub>8</sub>, R<sub>9</sub> or R<sub>10</sub> is methoxy or ethoxy;
  - R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>7</sub>, R<sub>8</sub>, R<sub>9</sub> or R<sub>10</sub> is secondary C<sub>3</sub>-C<sub>8</sub>alkyl or tertiary C<sub>4</sub>-C<sub>8</sub>alkyl or C<sub>3</sub>-C<sub>8</sub>alkoxy;
  - R<sub>2</sub>, R<sub>3</sub>, R<sub>7</sub> or R<sub>8</sub> is C<sub>1</sub>-C<sub>8</sub>alkoxy-C<sub>2</sub>-C<sub>8</sub>alkylene or C<sub>1</sub>-C<sub>8</sub>alkoxy-C<sub>2</sub>-C<sub>8</sub>alkyleneoxy;

or

- $R_4$  is  $C_5$ - $C_8$ cycloalkyl,  $C_5$ - $C_8$ cycloalkoxy, phenyl, phenoxy or a 5- or 6-membered heterocyclic radical.

2. A compound according to claim 1, wherein B is selected from groups of the formulae



where  $R_{15}$  is  $-\text{CR}_1\text{R}_7\text{R}_{11}$  and  $R_{16}$  is  $-\text{CR}_2\text{R}_3-\text{CR}_4\text{R}_8\text{R}_{12}$  or  $-\text{CR}_2\text{R}_3-\text{G}_1\text{R}_{14}$ , and  $R_2, R_3, R_4, R_7, R_8, R_9$  or  $R_{10}$  is secondary  $C_3$ - $C_8$ alkyl or tertiary  $C_4$ - $C_8$ alkyl, especially tert-butyl, tert-amyl or 2,4-dimethyl-2-pentyl.

3. A process for mass colouration of a polymer, which comprises adding at least one compound of the formula (I) according to claim 1 to the polymer before or during processing, the processing taking the form of extrusion, injection moulding or fibre spinning at 220 to 330°C.

4. An engineering plastic having a glass transition point ( $T_g$ ) of 220 to 330°C, preferably polyolefin, polyester, polyamide or a polyimide, polysulfone, polyether sulfone, polyphenylene oxide, polyarylene, polyarylene sulfide, polyepoxide, polyphenylene oxide or ABS, pigmented according to claim 3.

5. An engineering plastic according to claim 4 in the form of a fibre.

6. A process for pigmenting a porous material, which comprises at least one compound of the formula (I) according to claim 1, in liquid form or dissolved in an inert liquid in a weight concentration of at least 25%, penetrating into the pores of the porous material and thereafter being thermally converted into a pigment of the formula  $A(H)_x$  (VI).

7. Material pigmented according to claim 6, selected from anodized aluminium and sintered boridic material.

8. High molecular weight organic material having a glass transition point ( $T_g$ ) of 140°C to

FOOTER: 428/472.2

527

427

428/131+

2

Ex. D4, p 20+

428/472.2  
~ Ex. D6-D7, p. 21

220°C and containing in its bulk 0.1 to 10% by weight of a compound of the formula (I), based on the total weight.

520  
9. A thermochromic material comprising a polymer coloured in the mass by a product obtainable by partial thermal decomposition of a compound of the formula (I) or by two compounds, selected from the group consisting of compounds of the formula (I) and pigments of the formula  $A(H)_x$  (VI).

10. A thermochromic material according to claim 9, which is comprised within a composite, preferably within a security item.

11. A compound according to claim 1, wherein  $E_1$  is oxygen, methylene or two separate radicals  $R_7$  and  $R_8$ .

12. A compound according to claim 11, wherein  $E_1$  is methylene or two separate radicals  $R_7$  and  $R_8$ .

13. A compound according to claim 1, wherein  $E_2$  is ethylene or two separate radicals  $R_{11}$  and  $R_{12}$ .

14. A compound according to claim 1, wherein  $G_1$  is O.

15. A compound according to claim 1, wherein  $R_1$  is hydrogen, methyl, ethyl, methoxy or ethoxy.

16. A compound according to claim 1, wherein  $R_2$ ,  $R_3$  and  $R_4$  are hydrogen or  $C_1$ - $C_8$ alkyl.

17. A compound according to claim 1, wherein  $R_5$ ,  $R_6$ ,  $R_9$ ,  $R_{10}$  and  $R_{12}$  are methyl, secondary  $C_3$ - $C_8$ alkyl or tertiary  $C_4$ - $C_8$ alkyl.

18. A compound according to claim 1, wherein  $R_7$ ,  $R_8$  and  $R_{11}$  are hydrogen or methyl, especially hydrogen.

19. A compound according to claim 18, wherein  $R_7$ ,  $R_8$  and  $R_{11}$  are hydrogen.

20. A compound according to claim 1, wherein  $R_{14}$  is  $C_1$ - $C_8$ alkyl.

21. A compound according to claim 1, wherein said B groups exclusively of the carboxyl group contain at most 3 further oxygen atoms.

22. A compound according to claim 21, wherein said B groups contain no or 1 further oxygen atom.

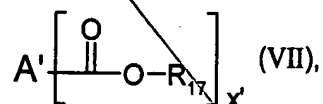
23. A compound according to claim 21, wherein said B groups exclusively of the carboxyl group contain 2 or 3 further oxygen atoms and no carbon atom in this B group other than in the carboxyl group is bonded to more than one oxygen atom.

24. A compound according to claim 1, wherein said groups of the formulae (II) or (III) are asymmetrical.

25. A binary or ternary mixture including 60 to 99.9% by weight of a compound of the formula (I) and 0.1 to 40% by weight of one or two thermally more labile compounds of the same chromophore class with an A' that differs from A.

26. A mixture according to claim 27, which is a binary mixture of 99.5 to 95% by weight of a compound of the formula (I) and 0.5 to 5% by weight of a thermally more labile compound of the same chromophore class with an A' that differs from A.

27. A compound according to claim 25, wherein the thermally more labile compound of the same chromophore class with an A' that differs from A is a compound of the formula



where  $x'$  is an integer from 1 to 8 and  $A'$  is the radical of a chromophore of the quinacridone, anthraquinone, perylene, indigo, quinophthalone, indanthrone, isoindolinone, isoindoline, dioxazine, azo, phthalocyanine or diketopyrrolopyrrole series, this radical being linked with  $x'$  -COOR<sub>17</sub> groups via one or more heteroatoms, these heteroatoms being selected from the group consisting of N, O and S and forming part of the radical  $A'$  and R<sub>17</sub> being any desired tertiary group.

28. A compound according to claim 27, wherein said R<sub>17</sub> radicals are selected from the group consisting of tert-butyl, tert-amyl, 2-methyl-3-buten-2-yl, 2-methyl-3-buten-2-yl, 4-oxa-

1-2-oc

eptyl, 2  
 uyl, ca  
 ng to c  
 2-meth  
 clohex  
 ng to c

to claim 29, wherein  $R_{18}$  s  
(methoxy-ethoxy)-cyclohexyl,  
hexyl or 4-heptyl.

to claim 29, wherein  $R_{18}$  s

31. A compound according to claim 29, wherein R<sub>18</sub> stands for (-)-2-isopropyl-5-methyl-cyclohexyl or 4-heptyl.